CLAIMS

What is claimed is:

1. A method for operating a radio frequency RF receiver of a communications equipment, comprising:

under the control of a data processor of the communications equipment,

generating a calibration signal;

injecting the calibration signal into a low noise amplifier LNA of the RF receiver;

measuring a downconverted response of the receiver at a plurality of different internal states of the receiver using at least one frequency of the calibration signal; and

at least one of tuning a resonance frequency of at least one LNA resonator based on the measured downconverted response so as to compensate at least for variations in component values that comprise the at least one resonator, or adjusting the linearity of the receiver.

2. A method as in claim 1, where the calibration signal is generated using a frequency synthesizer of the communications equipment.

3. A method as in claim 1, where the calibration signal is generated using an oscillator that comprises said at least one LNA resonator.

4. A method as in claim 1, where the resonance frequency is tuned based on a strongest measured downconverted response, and where the linearity is adjusted based on a weakest downconverted response.

5. A method as in claim 1, where the step of tuning a resonance frequency of the at least one LNA resonator comprises also fine tuning the resonance to compensate for

variations in power supply current using one of predetermined information or executing the calibration procedure at different power supply current levels.

6. A method as in claim 1, where generating the calibration signal comprises generating a modulated calibration signal, and where adjusting the linearity of the receiver comprises making an adjustment for either the second order input intercept point IIP2 or the third order input intercept point IIP3.

7. A method as in claim 1, where an output of the LNA is coupled to an input of a downconversion mixer, and where the step of measuring observes an output of a received signal strength indicator RSSI that is located downstream from the downconversion mixer.

8. A method as in claim 1, where the receiver is a direct conversion receiver, where an output of the LNA is coupled to an input of a downconversion mixer, and where the calibration signal is modulated so as to avoid the generation of a DC or a passband signal at the output of the downconversion mixer during normal downconversion operation.

9. A method as in claim 1, where generating the calibration signal comprises attenuating the calibration signal.

10. A method as in claim 1, where injecting the calibration signal includes disabling a normal received signal input to the LNA.

11. A method as in claim 1, where the communications equipment comprises a mobile station that operates in accordance with a TDMA protocol.

12. A method as in claim 1, where the communications equipment comprises a mobile station that operates in accordance with a CDMA protocol.

13. A method as in claim 1, where the RF receiver comprises a direct conversion receiver, and where the communications equipment comprises a mobile station that operates in accordance with a CDMA protocol.

14. A method as in claim 1, where the communications equipment comprises a base

station that operates in accordance with one of a TDMA protocol or a CDMA protocol.

15. A method as in claim 1, and further comprising changing the resonance frequency after calibrating, and during normal operation, based on a current local oscillator frequency.

16. A radio frequency RF receiver of a communications equipment, comprising calibration circuitry that operates under control of a data processor of communications equipment for calibrating RF circuitry of said communications equipment in the field, said calibration circuitry comprising a source of a calibration signal and circuitry for coupling a RF receiver calibration signal to a low noise amplifier LNA of said RF receiver; further comprising circuitry for measuring a downconverted response of said RF receiver at a plurality of different internal states of said receiver using at least one frequency of the calibration signal and for tuning a resonance frequency of at least one LNA resonator based on the measured downconverted response so as to at least one of compensate at least for variations in component values that comprise said at least one resonator, or for adjusting the linearity of said RF receiver.

17. A RF receiver as in claim 16, where said calibration signal source comprises a frequency synthesizer of said communications equipment.

18. A RF receiver as in claim 16, where said calibration signal source comprises an oscillator that in turn comprises said at least one LNA resonator.

19. A RF receiver as in claim 16, where said resonance frequency is tuned based on a strongest measured downconverted response, and where said linearity is adjusted based on a weakest downconverted response.

20. A RF receiver as in claim 16, where said circuitry for tuning said resonance frequency also fine tunes said resonance to compensate for variations in power supply current using one of predetermined information or executing the calibration procedure at different power supply current levels.

21. A RF receiver as in claim 16, and further comprising a modulator for modulating

said calibration signal, and where said circuitry for adjusting said linearity of said RF receiver comprises making an adjustment for either a second order input intercept point IIP2 or a third order input intercept point IIP3.

22. A RF receiver as in claim 16, where an output of said LNA is coupled to an input of a downconversion mixer, and where said measuring circuitry observes an output of a received signal strength indicator RSSI that is located downstream from said downconversion mixer.

23. A RF receiver as in claim 16, where said RF receiver is a direct conversion receiver, where an output of said LNA is coupled to an input of a downconversion mixer, and where said calibration signal is modulated to avoid generating a DC signal or a passband at an output of said downconversion mixer during normal downconversion operation.

24. A RF receiver as in claim 16, where said source comprises an attenuator for attenuating an output of a frequency synthesizer to provide said calibration signal.

25. A RF receiver as in claim 16, where when said calibration signal is coupled to said LNA a normal received signal input to said LNA is disabled.

26. A RF receiver as in claim 16, where said communications equipment comprises a mobile station that operates in accordance with a TDMA protocol.

27. A RF receiver as in claim 16, where said communications equipment comprises a mobile station that operates in accordance with a CDMA protocol.

28. A RF receiver as in claim 16, where said RF receiver comprises a direct conversion receiver, and where said communications equipment comprises a mobile station that operates in accordance with a CDMA protocol.

29. A RF receiver as in claim 16, where said communications equipment comprises a base station that operates in accordance with one of a TDMA protocol or a CDMA protocol.

30. A RF receiver as in claim 16, where said communications equipment changes the resonance frequency after calibrating, and during normal operation, based on a current local oscillator frequency.

31. A low noise amplifier for use in a radio frequency receiver chain of communications equipment, comprising at least one gain element and at least one resonant LC tank circuit coupled to said gain element, further comprising at least one further gain element coupled to said LC tank circuit for operating as an oscillator for generating a calibration signal for calibrating at least said low noise amplifier.

32. A low noise amplifier as in claim 31, and further comprising a phase lock loop circuit coupled to said oscillator, where said oscillator output is set to a center frequency of said low noise amplifier.

33. A method for operating a radio frequency RF receiver of a communications equipment, comprising:

under the control of a data processor of the communications equipment,

generating a fixed calibration signal;

injecting the fixed calibration signal into a low noise amplifier LNA of the RF receiver;

tuning the LNA to a plurality of different tuning points and measuring a corresponding downconverted response of the receiver; and

at least one of tuning a resonance frequency of at least one LNA resonator based on the measured downconverted response so as to compensate at least for variations in component values that comprise the at least one resonator, or adjusting the linearity of the receiver.

34. A method as in claim 33, where the calibration signal is generated using a frequency synthesizer of the communications equipment.

35. A method as in claim 33, where the calibration signal is generated using an oscillator that comprises said at least one LNA resonator.

36. A method as in claim 33, where the resonance frequency is tuned based on a strongest measured downconverted response, and where the linearity is adjusted based on a weakest downconverted response.

37. A method as in claim 33, and further comprising changing the resonance frequency after calibrating, and during normal operation, based on a current local oscillator frequency.

38. A method for operating a mobile station comprising, during a time that a receiver is not required, operating a data processor of said mobile station for at least partially disabling a receiver low noise amplifier LNA, generating a calibration signal within said mobile station, coupling said calibration signal into said receiver, measuring a downconverted response of the receiver to said calibration signal, and at least one of tuning a resonance frequency of at least one LNA resonator based on the measured downconverted response, or adjusting the linearity of a receiver chain.

39. A method for operating a mobile station comprising, during a time that a receiver is required, operating a data processor of said mobile station for enabling a receiver low noise amplifier LNA, generating a calibration signal within said mobile station, coupling said calibration signal into said receiver, measuring a downconverted response of the receiver to said calibration signal, and at least one of tuning a resonance frequency of at least one LNA resonator based on the measured downconverted response, or adjusting the linearity of a receiver chain.

40. A method as in claim 39, where the downconverted calibration signal is located outside of a receiver passband transfer function so that the calibration signal is not totally rejected.

41. A method as in claim 39, where the downconverted calibration signal is separated from the received signal spectrum by bandpass filtering in the digital domain.